Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Advanced Research Projects Agency										Date: February 2016	

Appropriation/Budget Activity
0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*

R-1 Program Element (Number/Name)
PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
Total Program Element	-	229.945	201.335	155.081	-	155.081	185.554	174.104	163.853	164.183	-	-
CCC-02: *INFORMATION INTEGRATION SYSTEMS*	-	124.497	102.415	93.781	-	93.781	129.204	123.909	142.233	152.183	-	-
CCC-04: *SECURE INFORMATION AND NETWORK SYSTEMS*	-	2.450	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	-	-
CCC-06: *COMMAND, CONTROL AND COMMUNICATION SYSTEMS*	-	102.998	98.920	61.300	-	61.300	56.350	50.195	21.620	12.000	-	-

A. Mission Description and Budget Item Justification

The Command, Control and Communications Systems program element is budgeted in the Advanced Technology Development Budget Activity because its purpose is to demonstrate and evaluate advanced information systems research and development concepts.

The goal of the Information Integration Systems project is to develop and demonstrate technologies that will provide effective communications to U.S. forces. The success of military operations depends on timely, reliable, secure, and synchronized dissemination of command and control and relevant situational awareness information to every military echelon. While wired communications and networks are fairly well developed, providing assured high-bandwidth mobile wireless capabilities that match or exceed commercial wired infrastructure is needed to meet the demands of military users. Approaches to this goal include developing technologies in these areas:
- High-Capacity Links technologies - enables greater back-haul capability.
- Advanced Networking technologies - supports resilience, adaptability, and scalability.
- Low Probability of Detection and Anti-Jam (LPD/AJ) technologies - provides assured communications in a very high-threat environments.
- Novel Radio Frequency and Spectral Sensing (RF/SS) - supports efficient spectrum management in congested environments and detection of electromagnetic threats.

The Secure Information and Network Systems project developed and demonstrated computer and network technologies and systems suitable for use in military networks, U.S. government enterprise networks, critical infrastructure, and embedded computing systems. The project developed, integrated, and tested technologies for re-using software components.

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Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	

B. Program Change Summary ($ in Millions)	**FY 2015**	**FY 2016**	**FY 2017 Base**	**FY 2017 OCO**	**FY 2017 Total**
Previous President's Budget	239.265	201.335	122.646	-	122.646
Current President's Budget	229.945	201.335	155.081	-	155.081
Total Adjustments	-9.320	0.000	32.435	-	32.435
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-2.033	0.000			
• SBIR/STTR Transfer	-7.287	0.000			
• TotalOtherAdjustments	-	-	32.435	-	32.435

Change Summary Explanation

FY 2015: Decrease reflects reprogrammings and the SBIR/STTR transfer.
FY 2016: N/A
FY 2017: Increase reflects expansion of Project CCC-06 programs.

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*
Defense Advanced Research Projects Agency

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 I 3	R-1 Program Element (Number/Name) PE 0603760E I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS	Project (Number/Name) CCC-02 I INFORMATION INTEGRATION SYSTEMS

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
CCC-02: INFORMATION INTEGRATION SYSTEMS	-	124.497	102.415	93.781	-	93.781	129.204	123.909	142.233	152.183	-	-

A. Mission Description and Budget Item Justification

The success of military operations depends on timely, reliable, secure, and synchronized dissemination of command and control and relevant situational awareness information to every military echelon. While wired communications and networks are fairly well developed, providing assured high-bandwidth mobile wireless capabilities that match or exceed commercial wired infrastructure is needed to meet the demands of military users. The goal of the Information Integration Systems project is to develop and demonstrate technologies that will provide effective communications to U.S. forces. Approaches to this goal include developing technologies in these areas:
- High-Capacity Links technologies - enables greater back-haul capability.
- Advanced Networking technologies - supports resilience, adaptability, and scalability.
- Low Probability of Detection and Anti-Jam (LPD/AJ) technologies - provides assured communications in very high-threat environments.
- Novel Radio Frequency and Spectral Sensing (RF/SS) - supports efficient spectrum management in congested environments and detection of electromagnetic threats.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: 100 Gb/s RF Backbone **Description:** The proliferation of video, voice, chat, and other important data-streams on the battlefield is driving a need for higher capacity, reliable, assured, and all-weather communications that are deployable on a wide range of air, ground, and maritime platforms. The goal of this High-Capacity Links technologies program is to demonstrate a 100 Gigabit-per-second (Gb/s) radio frequency (RF) backbone that will meet the anticipated mid-term (within 3-10 years) wireless networking requirements of deployed military forces. DARPA's hybrid Free Space Optical RF Communications Adjunct (ORCA) system has broken the 10 Gb/s wireless network boundary using free-space optical links, but all-weather Ku band components are currently limited to much less than 1Gb/s capacity. Furthermore, the hybrid optical/RF system exhibits size, weight, and power (SWaP) consumption characteristics that preclude deployment on many SWaP-limited platforms. Moving to a millimeter-wave (mmW) solution will provide high capacity and all-weather resiliency, but presents technical challenges that include the generation of higher-order waveforms (beyond common data link), efficient power transmission, high-speed routing, and low-noise receivers. This program seeks to develop the constituent subsystems (waveform generation, efficient power amplifiers, and receivers) and spatial multiplexing architectures to construct an all-weather mmW 100 Gb/s backbone at half the SWaP consumption of the current ORCA system. The 100 Gb/s RF Backbone program is intended for transition to multiple Services. **FY 2015 Accomplishments:** - Built and evaluated modulators capable of generating higher-order waveforms and demodulators capable of digitizing the higher-order waveforms.	13.200	21.750	15.638

PE 0603760E: COMMAND, CONTROL AND COMMUNICATIONS SYST...

Exhibit R-2A, **RDT&E Project Justification:** PB 2017 Defense Advanced Research Projects Agency		**Date:** February 2016
Appropriation/Budget Activity 0400 *I* 3	**R-1 Program Element (Number/Name)** PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	**Project (Number/Name)** CCC-02 *I INFORMATION INTEGRATION SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	**FY 2015**	**FY 2016**	**FY 2017**
- Evaluated higher-order modulation approaches at mmW frequencies in field demonstrations up to tactically relevant distances. - Evaluated hardware and software capable of spatially multiplexing and de-multiplexing multiple mmW signals. - Evaluated mmW spatial multiplexing approaches to distances at or beyond the Rayleigh Range. - Commenced design and development of an integrated prototype system that includes both higher-order modulation and spatial multiplexing. *FY 2016 Plans:* - Continue to reduce the size, weight, and power of the system components to metrics consistent with high altitude, long endurance aerial platforms. - Conduct laboratory tests of merged higher-order modulation and spatial multiplexing technologies. - Initiate prototype performance evaluation planning for mountain-to-ground tests at a Government test range. - Conduct initial prototype testing using multiple system configurations to characterize initial system performance. *FY 2017 Plans:* - Conduct multiple field tests of the prototype hardware at a Government test range. - Integrate prototype onto test aircraft and conduct air-to-ground testing at a Government test range. - Transition the 100 Gb/s RF Backbone system to multiple Services.			
Title: Spectrum Efficiency and Access *Description:* Current Presidential Initiatives, FCC Broadband Task Force, and Congressional legislation are working to transition large swaths of spectrum (up to 500 MHz) from Federal (DoD is the primary contributor) to civilian use for broadband telecommunications. The DoD will need more highly integrated and networked data/sensor capacity over the next decades and will therefore need new technology that requires less spectrum to operate. The objective of the Spectrum Efficiency and Access program is to investigate improvements in spectral reuse, such as spectrum sharing of sensor/radar bands. The program will leverage technical trends in cooperative sharing to exploit radar anti-jam and interference mitigation technologies that could enable spectrum sharing by allowing overlay of communications within the same spectral footprint. The approach will include exploring real-time control data links between radars and communications systems, and developing the advanced waveforms and components to enable radars and communication networks to operate in close proximity. The ultimate goal is to turn the DoD spectrum loss into a net gain of up to hundreds of MHz in capacity. Technology from this program will be made available to the DoD. *FY 2015 Accomplishments:* - Modeled and assessed multiple mechanisms for spatial and temporal spectrum sharing between radars and communications networks.	17.462	16.990	15.752

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603760E / *COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	**Project (Number/Name)** CCC-02 / *INFORMATION INTEGRATION SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Developed and assessed a baseline set of strategies to defend military systems against threats created by sharing spectrum information between military radars and commercial communications systems. - Developed concepts for a control system to manage mechanisms for spectrum sharing between radars and communication systems. - Demonstrated technologies for signal separation between radar and communications systems operating at the same time, place, and frequency. - Developed concepts and approaches for a joint system design between military radar and military communications systems operating in a shared spectrum allocation that improves overall performance in electronic countermeasure operating environments. *FY 2016 Plans:* - Model and assess methods for automatically mitigating interfering transmissions caused by malfunctioning or misconfigured communications devices. - Develop and assess updated strategies to defend military systems against threats created by sharing spectrum information between military radars and commercial communications systems. - Develop baseline version of control system to manage spectrum sharing mechanisms. - Conduct laboratory demonstrations of spectrum sharing among conforming radar and military and commercial communications systems that incorporates multiple sharing mechanisms. - Perform initial vulnerability assessment of the spectrum sharing control system and sharing mechanisms through simulated attacks. - Model and assess performance of jointly designed military radar and military communications systems operating in a shared spectrum allocation in electronic countermeasure operating environments. *FY 2017 Plans:* - Develop improved version of control system to manage spectrum sharing mechanisms. - Modify military and commercial radio and communications systems to support spectrum sharing mechanisms. - Conduct field demonstrations of spectrum sharing among conforming radar and communications systems that incorporates multiple sharing mechanisms. - Reassess vulnerability of the spectrum sharing control system and sharing mechanisms through simulated attacks. - Develop methods for automatically mitigating interfering transmissions caused by malfunctioning or misconfigured communications devices and assess through simulations.			
Title: Advanced RF Mapping *Description:* One of the key advantages on the battlefield is the ability to actively sense and manipulate the radio frequency (RF) environment, enabling reliable and assured communications, as well as effectively mapping and manipulating the adversary's	17.705	17.125	11.866

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
communications in ways that defy their situational awareness, understanding, or response. Current approaches are emitter-based, with the signal processing techniques focused on array and time-based processing for each emitter. As the RF environment becomes more complex and cluttered, the number of collection assets and the required level of signal processing inhibits our capability to pervasively sense and manipulate at the precision (time, frequency, and space) required for effective action. To address these Radio Frequency and Spectral Sensing (RF/SS) challenges, the Advanced RF Mapping program will develop and demonstrate new concepts for sensing and manipulating the RF environment based on distributed rather than centralized collection. This approach will take advantage of the proliferation of RF devices, such as radios and cell phones, on the battlefield. To leverage these existing devices effectively, the program will develop new algorithms that can map the RF environment with minimal communication load between devices. It will also develop approaches to exploit our precise knowledge of the RF environment and the distributed proximity of RF devices to provide reliable and assured communications for our warfighter as well as to infiltrate or negate our adversaries' communications networks. Building upon technologies investigated within other programs within this project, the Advanced RF Mapping program will enable both offensive and defensive operations in complex RF environments. Advanced RF Mapping technology is planned to transition to the Services. *FY 2015 Accomplishments:* - Carried out field experiments that demonstrated use of currently deployed tactical radios as sensors within a heterogeneous RF mapping network. - Developed a software layer that simplifies addition of new capabilities to the heterogeneous RF mapping network after it has been fielded. - Demonstrated improved battlefield spectrum planning and spectrum management operations through feedback of spectrum utilization information from RF sensors. - Developed a command and control system for optimizing use of devices as RF sensors in a changing operational environment. - Developed and demonstrated geo-location capability of RF emitters using the heterogeneous RF mapping network. *FY 2016 Plans:* - Conduct RF Mapping tactical demonstrations. - Develop a baseline sensor management user interface and command and control software layer to enable mission planners to task RF devices and configure the RF mapping system. - Develop a baseline user interface for presenting RF mapping information to tactical units. - Develop software for interconnecting the RF mapping capability with other tactical Electronic Warfare (EW) systems enabling cueing and results sharing. - Develop interface control documentation (ICD) that permits vendors to independently integrate third party RF devices and applications for use as additional RF Mapping sensors.			

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 *I* 3	**R-1 Program Element (Number/Name)** PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	**Project (Number/Name)** CCC-02 *I INFORMATION INTEGRATION SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Develop software for storing RF maps and querying the stored data for both tactical use and post-mission analysis. *FY 2017 Plans:* - Enhance the baseline sensor management and RF Mapping user interfaces for the Services. - Develop final Command and Control (C2) software configurations to integrate RF Mapping sensors into existing Service architectures, to enhance RF sensing capacity. - Continue to participate in Service exercises to demonstrate the system's ability to provide RF sensing and manipulation and inform new tactics, techniques and procedures.			
Title: Communication in Contested Environments (C2E) *Description:* Building upon the technologies explored and developed under the Computational Leverage Against Surveillance Systems (CLASS) program budgeted in this PE/Project, the Communication in Contested Environments (C2E) program will seek to address communications problems anticipated in networked airborne systems in the mid-21st century. Expected growth in sensor systems, unmanned systems, and internetworked weapons systems will strain the size of networks that our current communications technology can support in the contested environment. As adversary capabilities advance, the DoD will need new techniques to quickly and efficiently accommodate better networking and improved communications capabilities, specifically communications systems with higher capacity, lower latency, greater jamming resistance, and reduced detectability. As part of Advanced Networking technologies efforts, the C2E program addresses these needs with a three-pronged approach: first, to develop heterogeneous networking capabilities and advanced communication technology for airborne systems. Low Probability of Detection (LPD), Anti-Jam (AJ), low latency, and high capacity communication protocols will be developed. Second, to create a government controlled and maintained reference architecture for communications systems that draws from commercial communication architectures. The defense contractor community can build specific communications systems based upon this reference architecture. Finally, C2E will create a government controlled development environment to allow rapid refresh of communications technology and allow third party native application and waveform developers to contribute their own communications technologies. Technologies from this program are planned to transition to the Services. *FY 2015 Accomplishments:* - Designed, built, and tested the RF Transceiver and Digital waveform processor circuit card assemblies leveraging technology from the DARPA CLASS program. - Designed, built, and tested a communications reference hardware system to support L-band and microwave communications. - Decomposed waveform implementations into re-usable processing elements and compiled representative waveforms for the reference hardware, including initial design for an application-specific integrated circuit (ASIC). - Tested infrastructure networking code on the reference system and evaluated pervasive networking performance.	18.000	18.000	9.263

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Deployed the first instantiation of the software development environment for streamlined creation of C2E compliant waveforms and applications. *FY 2016 Plans:* - Complete development of advanced network processing functions for implementation in an ASIC. - Finalize and integrate LPD/AJ capabilities. - Release updated version of the combined software architecture, development environment and tool set, verification environment, and repository. - Demonstrate Heterogeneous Networking LPD/AJ features, and implement an initial prototype of the C2E reference design on a small form factor radio. - Finalize development of the C2E waveforms and demonstrate performance through laboratory testing. - Demonstrate airborne tactical network waveform interoperability on the C2E reference architecture. - Enhance the software development environment to improve functionality and ease of use. *FY 2017 Plans:* - Finalize verification testing and system integration of the C2E ASIC. - Complete development of the C2E ASIC operating system, hardware drivers, and encoder drivers. - Complete development and testing of the small form factor radio with integrated C2E ASIC. - Demonstrate legacy waveform interoperability on the small form factor radio.			
Title: Communications Module - Millimeter-wave (COMMO-MMW) *Description:* The Communications Module - Millimeter-wave (COMMO-MMW) program will develop a compact, scalable, millimeter wave (mm-wave) active electronically scanned array (AESA) module to enable high-performance communications links. The module will focus on low cost connectivity of weapons platforms and systems. The cost will be reduced through exploitation of mass manufacturing techniques at the chip scale and a reduction in size of the system which will aid in retrofitting into existing platforms. The COMMO-MMW module will operate in the high frequency portion of the electromagnetic spectrum to take advantage of reduced competition for bandwidth compared to the increasingly congested bands at lower frequencies. By leveraging mass manufacturing processes to reduce module cost, and new advances in compound semiconductors to enhance system performance, the COMMO-MMW program will realize affordable mm-wave communications that can be made ubiquitous across the domains of modern warfare. Additionally, mm-wave operation offers the potential for extremely high data rate communications links that are intrinsically jam resistant and low probability of detection due to narrow beamwidths and atmospheric propagation characteristics at these frequencies. The lack of commercial component technology in the mm-wave band will further increase the military advantage gained by this capability. This program will develop the critical compound semiconductor devices and circuits for high performance, high power efficiency mm-wave front end electronics, and will apply 3-D and/or heterogeneous integration approaches to build a compact, scalable, mm-wave AESA module. COMMO-MMW not only will	-	7.000	22.762

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 *I* 3	**R-1 Program Element (Number/Name)** PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	**Project (Number/Name)** CCC-02 *I INFORMATION INTEGRATION SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
revolutionize Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) capability but also make it possible and affordable to retrofit existing military systems and extend high performance communications link capability to smaller platforms. Technologies developed under this program will transition to the Services and will provide the capability of "fiber-like" connectivity rates in infrastructure free environments. *FY 2016 Plans:* - Analyze and design a compact, scalable, mm-wave AESA module supporting a communication demonstration system for long-range power-constrained missions. - Define specifications for the critical components of a 4 x 4 element AESA. - Develop and demonstrate integration approaches for a compact, scalable, mm-wave AESA module with high output power and high power-added efficiency. *FY 2017 Plans:* - Develop and demonstrate mm-wave devices and circuits to be integrated for transmitter and receiver array demonstration. - Develop a system integration and test plan for the 4x4 element AESA system. - Develop and demonstrate a low-bandwidth communications link based on the COMMO-MMW 4x4 element arrays.			
Title: Dynamic Network Adaptation for Mission Optimization (DyNAMO)* *Description:* *Formerly Self-Optimizing Networks Wireless networks have evolved into complex systems having many configurable parameters/features, including link data rates, power settings, inter-network gateways, and security associations. The optimal settings for these features vary greatly depending on the mission for which the network is deployed and the environment in which it is operating. Currently, the majority of these features are optimized off-line for specific scenarios and assumptions and are pre-set before use in a mission. There is no capability for the settings to adapt if the actual mission or environment differs from the original assumptions used to configure the network. The problem is exacerbated in scenarios in which intelligent adversaries can affect the topology and operation of the network unpredictably and on short timescales. Furthermore, future operations will include multiple, different radios interconnected on the same platform, and those existing networks lack a common standard for interoperability. The Dynamic Network Adaptation for Mission Optimization (DyNAMO) program will develop software that addresses the incompatibilities preventing information sharing across independent airborne networks and develop new approaches to configure and control networks and networks of networks for operation in dynamic and contested environments. The program will address optimization within legacy and future military networks, interactions between networks, and availability of necessary network services to support mission success. Technologies developed under this program will transition to the Services. *FY 2016 Plans:*	-	5.050	18.500

Exhibit R-2A, **RDT&E Project Justification:** PB 2017 Defense Advanced Research Projects Agency		**Date:** February 2016
Appropriation/Budget Activity 0400 *I* 3	**R-1 Program Element (Number/Name)** PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	**Project (Number/Name)** CCC-02 *I INFORMATION INTEGRATION SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	**FY 2015**	**FY 2016**	**FY 2017**
- Commence development of candidate near-real-time optimization algorithms to improve network reliability and efficiency when affected by advanced threats. - Propose and analyze candidate inter-network coordination and decentralized network services for operation in the presence of a peer adversary. - Commence development of mission-based network architecture control and information delivery mechanisms. - Conduct testing of individual technology developments in an emulation environment. *FY 2017 Plans:* - Continue development of near-real-time optimization algorithms. - Develop and integrate inter-network coordination and decentralized network services. - Continue development and integration of mission-based network architecture control and information delivery mechanisms. - Conduct system-level emulation test of system with internetwork coordination and mission-based control. - Conduct hardware-in-the-loop test of system with internetwork coordination and mission-based control.			
Title: Wireless Network Defense *Description:* A highly networked and enabled force increases efficiency, effectiveness, and safety by making relevant information available when it is needed and at the appropriate location (person/platform/system). Accomplishing this depends on providing reliable wireless communications to all U.S. forces, platforms, and devices in all phases of conflict. Based on initial work under this effort, the Spectrum Efficiency and Access program in this PE/Project was created to enable reliable operation of military and commercial communications and radar systems when occupying the same spectrum bands. As part of the Advanced Networks technologies effort, the Wireless Network Defense program increases wireless network capacity and reliability for tactical users, with the ultimate vision of making high quality data services pervasive throughout the DoD. The primary focus is mitigation of advanced threats particular to the security of wireless networks. The program intends to leverage the capabilities of the dynamic network to identify sources of misinformation, whether malicious or due to poor configuration, across the functional components of the complex system, and mitigate the corresponding effects. Technologies developed under this program will transition to the Services. *FY 2015 Accomplishments:* - Completed integration of candidate algorithms and protocols for protecting networks from, and detecting and reacting to, misinformation attacks in laboratory-based prototype systems. - Created emulation testbed for evaluating performance of network under various network attacks. - Tested resilience of prototype capabilities in a laboratory environment. - Refined protection mechanisms based on test findings and began development of systems for field demonstrations.	18.880	16.500	-

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Quantified the performance impact of network misconfiguration in simulations of networks in contested environments. ***FY 2016 Plans:*** - Increase severity of attacks on prototype system and continue to test resilience in laboratory environment. - Complete integration of candidate algorithms and protocols to prepare for field experiments. - Test resilience of prototype capabilities against advanced attacks in a field environment. - Refine protection mechanisms based on test findings and begin development of systems for transition to military tactical radios. - Integrate with military tactical radios and quantify the performance impact through experiments.			
Title: Computational Leverage Against Surveillance Systems (CLASS) ***Description:*** Commercial Test and Measurement equipment has advanced greatly with the emergence of sophisticated cellular and wireless local area network technology and can be used to intercept, analyze, and exploit our military communications signals. The Computational Leverage Against Surveillance Systems (CLASS) program worked to expand Low Probability of Detection/Anti-Jam (LPD)/(AJ) technologies, sought new ways to protect our signals from exploitation by increasingly sophisticated adversaries in ways that can be maintained as commercial technology advances. Three different techniques were developed: 1) Waveform Complexity uses advanced communications waveforms that are difficult to recover without knowledge and understanding of the signals itself; 2) Spatial Diversity uses distributed communications devices and the communication environment to disguise and dynamically vary the apparent location of the signal; and 3) Interference Exploitation makes use of the clutter in the signal environment to make it difficult for an adversary to isolate a particular signal. The program's objective was to make modular communications technology that was inexpensive to incorporate in existing and emerging radio systems (< $100 incremental cost) but pushed adversaries to need more than 1,000x our processing power - supercomputer-level processing power. Another track of the program extended the CLASS technology to provide LPD communications. These techniques drastically reduced the detectability of communications signals beyond current capabilities. Scalable performance allowed LPD techniques to better trade information rate for communications capacity. Technologies from this program will transition to the Services. ***FY 2015 Accomplishments:*** - Developed concepts for integrating CLASS technologies with aircraft antennas and communications equipment. - Measured CLASS modem performance processing power, power consumption, and radio waveform interoperability. - Integrated CLASS modular technology with host processor. - Demonstrated CLASS communication capability with and without interference against Army threat intercept surrogates. - Measured CLASS modem transmit power reduction as number of cooperative transmitters was increased from 1 transmitter to multiple transmitters. - Conducted field tests of integrated CLASS system. - Analyzed field test data and compared achieved performance to program metrics.	24.600	-	-

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 *I* 3	**R-1 Program Element (Number/Name)** PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	**Project (Number/Name)** CCC-02 *I INFORMATION INTEGRATION SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	**FY 2015**	**FY 2016**	**FY 2017**
- Transitioned CLASS technology to Army and Navy customers.			
Title: Mobile Hotspots	14.650	-	-
Description: Communications requirements have grown exponentially due to the proliferation of high-data rate sensors (full motion video), Unmanned Aerial Vehicles (UAVs), and the emergence of the Soldier/Marine as both an operator and a sensor within military networks. However, limited spectrum availability results in a large disparity between capacity requirement and availability. Supporting the development of Advanced Networks technologies, Mobile Hotspots developed an airborne high capacity data distribution network to interconnect groups of tactical users in a manner conceptually similar to the commercial tiered approach of interconnecting cell towers and wireless hotspots. Mobile Hotspots exploited advances in millimeter-wave technology and airborne networking to develop a self-organizing, 1 Gb/s mobile tactical airborne network formed from highly-directional communications links to interconnect mounted and dismounted warfighters, dispersed tactical operations centers, and intelligence, surveillance and reconnaissance (ISR) assets. Low size, weight, and power (SWaP) designs were integrated with commercial and military communications equipment and mounted on tactical UAVs and ground vehicles to provide network access to mobile users via infrastructure-less hotspots compatible with existing radios. The Mobile Hotspots program will transition to the Army and Marine Corps Expeditionary Forces. *FY 2015 Accomplishments:* - Evaluated initial capabilities of the Mobile Hotspot prototype network and millimeter-wave tactical airborne network in an initial ground-based field experiment. - Identified and implemented system and subsystem improvements in preparation for final field experimentation and flight test. - Conducted ground testing of integrated air and ground vehicle systems to validate system operation and performance. - Conducted flight tests to evaluate system performance in various air-to-air, air-to-ground, and multi-node networking configurations.			
Accomplishments/Planned Programs Subtotals	124.497	102.415	93.781

C. Other Program Funding Summary ($ in Millions)
 N/A
Remarks

D. Acquisition Strategy
 N/A

E. Performance Metrics
 Specific programmatic performance metrics are listed above in the program accomplishments and plans section.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Defense Advanced Research Projects Agency														Date: February 2016

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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
100 Gb/s RF Backbone (100G)	C/Various	Various : Various	-	3.680		5.900		7.700		-		7.700	Continuing	Continuing	Continuing
100 Gb/s RF Backbone (100G)	C/CPFF	NORTHROP GRUMMAN SYSTEMS CORPORATION : CA	-	8.771	Sep 2015	12.607		4.350		-		4.350	Continuing	Continuing	Continuing
Spectrum Efficiency and Access	C/Various	Various : Various	-	10.950		8.942		10.413		-		10.413	Continuing	Continuing	Continuing
Spectrum Efficiency and Access	C/CPFF	LEIDOS,INC. : VA	-	5.353	Oct 2015	6.832		2.820		-		2.820	Continuing	Continuing	Continuing
Advanced RF Mapping	C/Various	Various : Various	-	6.648		6.926		7.273		-		7.273	Continuing	Continuing	Continuing
Advanced RF Mapping	C/CPFF	LOCKHEED MARTIN CORPORATION : VA	-	8.311	Sep 2015	7.918		3.750		-		3.750	Continuing	Continuing	Continuing
Communication in Contested Environments (C2E)	C/Various	Various : Various	-	13.797		13.876		8.051		-		8.051	Continuing	Continuing	Continuing
Communications Module - Millimeter-wave (COMMO-MMW)	C/Various	Various : Various	-	0.000		6.500		13.987		-		13.987	Continuing	Continuing	Continuing
Dynamic Network Adaptation for Mission Optimization (DyNAMO)	C/Various	Various : Various	-	0.000		4.500		16.900		-		16.900	Continuing	Continuing	Continuing
Wireless Network Defense	C/Various	Various : Various	-	14.145		12.193		0.000		-		0.000	0	26.338	0
Computational Leverage Against Surveillance Systems (CLASS)	C/Various	Various : Various	-	18.514		0.000		0.000		-		0.000	0	18.514	0
Mobile Hotspots	C/Various	Various : Various	-	5.674		0.000		0.000		-		0.000	0	5.674	0
Mobile Hotspots	C/CPFF	L-3 COMMUNICATIONS	-	6.200	Nov 2014	0.000		0.000		-		0.000	0	6.200	0

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016

Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603760E / COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS	Project (Number/Name) CCC-02 / INFORMATION INTEGRATION SYSTEMS

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		CORPORATION : UT													
Subtotal			-	102.043		86.194		75.244		-		75.244	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Support	MIPR	Various : Various	-	4.980		4.097		3.751		-		3.751	Continuing	Continuing	Continuing
Subtotal			-	4.980		4.097		3.751		-		3.751	-	-	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
100 Gb/s RF Backbone (100G)	C/Various	Various : Various	-	0.069		0.523		3.150		-		3.150	Continuing	Continuing	Continuing
Advanced RF Mapping	C/Various	Various : Various	-	0.525		1.220		0.329		-		0.329	Continuing	Continuing	Continuing
Communication in Contested Environments (C2E)	SS/FFP	Various : Various	-	3.836		3.810		0.382		-		0.382	Continuing	Continuing	Continuing
Communications Module - Millimeter-wave (COMMO-MMW)	C/Various	Various : Various	-	0.000		0.000		5.636		-		5.636	Continuing	Continuing	Continuing
Dynamic Network Adaptation for Mission Optimization (DyNAMO)	C/Various	Various : Various	-	0.000		0.000		0.600		-		0.600	Continuing	Continuing	Continuing
Wireless Network Defense	C/Various	Various : Various	-	2.385		1.450		0.000		-		0.000	0	3.835	0
Computational Leverage Against Surveillance Systems (CLASS)	SS/FFP	Various : Various	-	2.878		0.000		0.000		-		0.000	0	2.878	0

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*

Exhibit R-3, **RDT&E Project Cost Analysis:** PB 2017 Defense Advanced Research Projects Agency			**Date:** February 2016
Appropriation/Budget Activity 0400 *I* 3		**R-1 Program Element (Number/Name)** PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	**Project (Number/Name)** CCC-02 *I INFORMATION INTEGRATION SYSTEMS*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	Award Date	FY 2016 Cost	Award Date	FY 2017 Base Cost	Award Date	FY 2017 OCO Cost	Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Mobile Hotspots	C/Various	Various : Various	-	1.556		0.000		0.000		-		0.000	0	1.556	0
Subtotal			-	11.249		7.003		10.097		-		10.097	-	-	-

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	Award Date	FY 2016 Cost	Award Date	FY 2017 Base Cost	Award Date	FY 2017 OCO Cost	Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Support	C/Various	Various : Various	-	6.225		5.121		4.689		-		4.689	Continuing	Continuing	Continuing
Subtotal			-	6.225		5.121		4.689		-		4.689	-	-	-

	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	124.497	102.415	93.781	-	93.781	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603760E / COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS	Project (Number/Name) CCC-02 / INFORMATION INTEGRATION SYSTEMS

	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
100 Gb/s RF Backbone																												
System design and technology development / technology demonstrations		▮																										
Prototype testing						▮																						
Field testing									▮																			
System flight testing											▮																	
Spectrum Efficiency and Access																												
Demonstration of signal separation technologies	▮																											
Lab demonstration of spectrum sharing							▮																					
Limited field demonstrations										▮																		
Advanced RF Mapping																												
Field experiments and demonstration	▮																											
Demonstration of geo-location capability						▮																						
Tactical demonstration							▮																					
Software development & testing					▮	▮	▮																					
Field demonstrations										▮																		
Communication in Contested Environments (C2E)																												
Transceiver and waveform processor circuit card testing		▮																										
Infrastructure networking code testing			▮																									
Software development environment deployment				▮																								
Software architecture development & release						▮																						
Integrated system demo								▮																				

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*

Defense Advanced Research Projects Agency

R-1 Line #56

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603760E / COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS	**Project (Number/Name)** CCC-02 / INFORMATION INTEGRATION SYSTEMS

	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Networking demonstration									■																			
Communications Module- Millimeter-wave (COMMO-MMW)																												
Program initiation				■	■	■																						
COMMO-MMW Sub-Array Integration contract awards										■																		
Dynamic Network Adaptation for Mission Optimization (DyNAMO)																												
Program initiation				■	■	■																						
Mission based network technology testing						■	■																					
System-level emulation test								■	■																			
Mission-based network architecture integration									■	■	■																	
Hardware-in-the-loop system testing										■	■																	
Wireless Network Defense																												
Algorithm and protocol integration			■																									
Algorithm and protocol integration testing				■	■	■																						
Computational Leverage Against Surveillance Systems (CLASS)																												
Software/hardware testing		■																										
Field tests of integrated system			■																									
Mobile Hotspots																												
Build, integrate, and test / ground tests		■																										
Flight test and demonstration			■																									

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603760E / *COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	**Project (Number/Name)** CCC-02 / *INFORMATION INTEGRATION SYSTEMS*

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
100 Gb/s RF Backbone				
System design and technology development / technology demonstrations	2	2015	2	2015
Prototype testing	2	2016	2	2016
Field testing	2	2017	2	2017
System flight testing	4	2017	4	2017
Spectrum Efficiency and Access				
Demonstration of signal separation technologies	1	2015	1	2015
Lab demonstration of spectrum sharing	3	2016	3	2016
Limited field demonstrations	3	2017	3	2017
Advanced RF Mapping				
Field experiments and demonstration	1	2015	1	2015
Demonstration of geo-location capability	4	2015	4	2015
Tactical demonstration	3	2016	3	2016
Software development & testing	2	2016	4	2016
Field demonstrations	2	2017	2	2017
Communication in Contested Environments (C2E)				
Transceiver and waveform processor circuit card testing	2	2015	2	2015
Infrastructure networking code testing	3	2015	3	2015
Software development environment deployment	4	2015	4	2015
Software architecture development & release	2	2016	2	2016
Integrated system demo	3	2017	3	2017
Networking demonstration	1	2017	1	2017

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Defense Advanced Research Projects Agency				Date: February 2016	
Appropriation/Budget Activity 0400 *I* 3		**R-1 Program Element (Number/Name)** PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*		**Project (Number/Name)** CCC-02 *I INFORMATION INTEGRATION SYSTEMS*	

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Communications Module- Millimeter-wave (COMMO-MMW)				
Program initiation	1	2016	4	2016
COMMO-MMW Sub-Array Integration contract awards	3	2017	3	2017
Dynamic Network Adaptation for Mission Optimization (DyNAMO)				
Program initiation	1	2016	4	2016
Mission based network technology testing	3	2016	4	2016
System-level emulation test	1	2017	2	2017
Mission-based network architecture integration	2	2017	4	2017
Hardware-in-the-loop system testing	3	2017	4	2017
Wireless Network Defense				
Algorithm and protocol integration	4	2015	4	2015
Algorithm and protocol integration testing	2	2016	4	2016
Computational Leverage Against Surveillance Systems (CLASS)				
Software/hardware testing	3	2015	3	2015
Field tests of integrated system	4	2015	4	2015
Mobile Hotspots				
Build, integrate, and test / ground tests	3	2015	3	2015
Flight test and demonstration	4	2015	4	2015

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Advanced Research Projects Agency										Date: February 2016	
Appropriation/Budget Activity 0400 I 3					R-1 Program Element (Number/Name) PE 0603760E I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS					Project (Number/Name) CCC-04 I SECURE INFORMATION AND NETWORK SYSTEMS	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
CCC-04: SECURE INFORMATION AND NETWORK SYSTEMS	-	2.450	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	-	-

A. Mission Description and Budget Item Justification

Computer and networking technologies have advanced rapidly with profound effect on the DoD and the nation. The Secure Information and Network Systems project developed and demonstrated computer and network technologies and systems suitable for use in military networks, U.S. government enterprise networks, critical infrastructure, and embedded computing systems. The project developed, integrated, and tested technologies for re-using software components.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Rapid Software Development using Binary Components (RAPID) **Description:** The Rapid Software Development using Binary Components (RAPID) program developed a system to identify and extract software components for reuse in new applications. The DoD has critical applications that must be ported to future operating systems. In many cases, the application source code is no longer available requiring these applications to continue to run on unsecure and outdated operating systems, impacting operations. A companion applied research effort was budgeted in PE 0602303E, Project IT-03. RAPID capabilities are transitioning to the Services. **FY 2015 Accomplishments:** - Transitioned system outputs based on results from technology evaluation exercises. - Deployed prototype systems at transition partner sites to support initial operations.	2.450	-	-
Accomplishments/Planned Programs Subtotals	2.450	-	-

C. Other Program Funding Summary ($ in Millions)
N/A
Remarks

D. Acquisition Strategy
N/A

E. Performance Metrics
Specific programmatic performance metrics are listed above in the program accomplishments and plans section.

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 *I* 3	**R-1 Program Element (Number/Name)** PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	**Project (Number/Name)** CCC-04 *I SECURE INFORMATION AND NETWORK SYSTEMS*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
				Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Rapid Software Development using Binary Components (RAPID)	C/Various	Various : Various	-	2.229		0.000		0.000		-		0.000	0	2.229	0
		Subtotal	-	2.229		0.000		0.000		-		0.000	0.000	2.229	0.000

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
				Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Rapid Software Development using Binary Components (RAPID)	MIPR	Various : Various	-	0.098		0.000		0.000		-		0.000	0	0.098	0
		Subtotal	-	0.098		0.000		0.000		-		0.000	0.000	0.098	0.000

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
				Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Rapid Software Development using Binary Components (RAPID)	C/Various	Various : Various	-	0.123		0.000		0.000		-		0.000	0	0.123	0
		Subtotal	-	0.123		0.000		0.000		-		0.000	0.000	0.123	0.000

	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	2.450	0.000	0.000	-	0.000	0.000	2.450	0.000

Remarks

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*

Defense Advanced Research Projects Agency

R-1 Line #56

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 *I* 3	R-1 Program Element (Number/Name) PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	Project (Number/Name) CCC-04 *I SECURE INFORMATION AND NETWORK SYSTEMS*

	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Rapid Software Development using Binary Components (RAPID)																												
Participated in Cyber Flag Activities	███																											
Installed Pilot Systems at Transition Partner Site		███																										
Participated in Cyber Guard Activities			███																									
Participated in Red Flag Activities				███																								

Exhibit R-4A, **RDT&E Schedule Details:** PB 2017 Defense Advanced Research Projects Agency		**Date:** February 2016
Appropriation/Budget Activity 0400 *I* 3	**R-1 Program Element (Number/Name)** PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	**Project (Number/Name)** CCC-04 *I SECURE INFORMATION AND NETWORK SYSTEMS*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Rapid Software Development using Binary Components (RAPID)				
Participated in Cyber Flag Activities	1	2015	1	2015
Installed Pilot Systems at Transition Partner Site	2	2015	2	2015
Participated in Cyber Guard Activities	3	2015	3	2015
Participated in Red Flag Activities	4	2015	4	2015

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*
Defense Advanced Research Projects Agency

R-1 Line #56

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 *I* 3	**R-1 Program Element (Number/Name)** PE 0603760E *I COMMAND, CONTROL AND COMMUNICATIONS SYSTEMS*	**Project (Number/Name)** CCC-06 *I COMMAND, CONTROL AND COMMUNICATION SYSTEMS*

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
CCC-06: *COMMAND, CONTROL AND COMMUNICATION SYSTEMS*	-	102.998	98.920	61.300	-	61.300	56.350	50.195	21.620	12.000	-	-

A. Mission Description and Budget Item Justification

This project funds classified DARPA programs that are reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress.

B. Accomplishments/Planned Programs ($ in Millions)

	FY 2015	FY 2016	FY 2017
Title: Classified DARPA Program	102.998	98.920	61.300
Description: This project funds Classified DARPA Programs. Details of this submission are classified. **FY 2015 Accomplishments:** Details will be provided under separate cover. **FY 2016 Plans:** Details will be provided under separate cover. **FY 2017 Plans:** Details will be provided under separate cover.			
Accomplishments/Planned Programs Subtotals	102.998	98.920	61.300

C. Other Program Funding Summary ($ in Millions)
N/A
Remarks

D. Acquisition Strategy
N/A

E. Performance Metrics
Details will be provided under separate cover.

PE 0603760E: *COMMAND, CONTROL AND COMMUNICATIONS SYST...*
Defense Advanced Research Projects Agency